

Research Article

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Gunnar Lucko*

Financial Planning and Management Practices of Electrical Contractors

DOI 10.1515/otmcj-2016-0011

Received October 5, 2016; accepted November 8, 2016

Abstract: Contractors must carefully manage their cash outflows (e.g., for materials to enable their work) and inflows (after the work) to be profitable, particularly in an economy that is still recovering from the 2008–2012 recession that grew out of the mortgage crisis. Their importance for business success is undisputed, as bankruptcies due to insufficient cash flow underline. Therefore, this study investigated current business practices of electrical contracting companies of different sizes with respect to their financial planning and management. A detailed questionnaire was developed with best guidelines on survey studies and pilot testing. It was sent to members of the National Electrical Contractors Association. Respondent anonymity was ensured. The survey recorded demographics, business practices, operating conditions, and other important factors using 57 subquestions. Each section allowed feedback to clarify the numerical responses. Responses were well distributed across company sizes, so that the results are representative for the entire industry. The results indicated that contractors generally have a substantial amount of experience in financial decision making. Their approach is conservative and focuses on healthy growth. Yet, opportunities to fine-tune business practices are identified, e.g., immediate invoicing, considering discounts to accelerate payment receipts, attempting to negotiate and use favorable credit terms, reviewing payment performance, and performing frequent cash flow forecasts. Some of the differences in the responses can be attributed to different company sizes. To help especially smaller companies in planning their cash flow, a spreadsheet for implementation has been created.

Keywords: financial planning, financial management, survey questionnaire, best practices, cash flow

1 Introduction

1.1 Need and purpose

Cash flow has a key role in construction projects (Hwee and Tiong 2001) as a contributing factor to business success by achieving profitability. The 2008–2012 recession, which grew out of the mortgage crisis in the United States, and its global impact have left a weakened economic environment in the United States, Europe, and elsewhere. This makes it imperative to better understand cash flow at the portfolio (Purnus and Bodea 2015) and company levels. Treating it without the necessary care at the managerial level can lead to bankruptcy, even if the company is awarded a sufficient number of projects and all productive processes are performed perfectly (Touran et al. 2004, p. 719):

Construction contracting is a risky business. Data show that the rate of business bankruptcy for the construction contractor is much higher than the average business in the United States. In fact, business failures in construction industry account for about 12% of all the business failures in the country; approximately 20% of all construction-related businesses eventually fail (...). Between 1990 and 1997, 80,000 contractors went out of business, with liabilities of over \$21 billion (...). One leading cause of contractor's failure is cash flow problem. (...). The prudent contractor therefore, takes the cash flow issue very seriously and tries to control it the best he can.

The central role of cash flow management is underlined in the literature (Lucko 2011, p. 524):

The importance of carefully managing cash flow can hardly be overstated. It “cuts to the heart of the financial viability of a construction company” (Kenley 2003, p. 162) and leads to long-term profitability or bankruptcy from an inability to pay financing fees, debt reduction, and operations from inflows. (...) Besides “there are many factors that may affect the cash flow such as time delays, cost overruns, unconfirmed earned values, change orders, changes of cost plan elements, etc.” (Park 2004, p. 265). These items differ in timing, terms, and dependency.

Understanding the financial approaches of the U.S. electrical contracting industry can contribute to raising the

*Corresponding author: Gunnar Lucko, Department of Civil Engineering, Catholic University of America, Washington, DC 20064, USA. Email: lucko@cua.edu

awareness of its importance and identify areas where individual contractors may adopt or improve policies. Therefore, this study performs a detailed investigation of current practices and attitudes of electrical contractors, with a focus on cash flow management.

2 Research goal and objectives

To address the goal of understanding the current financial planning and management of electrical contractors, three sequential research objectives are established to be addressed as follows:

- Identify best practices for designing and performing survey research to achieve valid results;
- Analyze a sample of electrical contractors across a diverse set of size ranges considering their approaches to financial planning and management and derive commonalities and differences;
- Extract financial planning and management best practices for electrical and other contractors.

3 Detailed survey development

3.1 Permissions

The following specific considerations for survey studies have been extracted from the scientific literature on research design, e.g., Neuman (2000), Couper et al. (2001), Topp and Pawloski (2002), and Couper (2008). They have been compiled to guide the development of this survey questionnaire and ensure its rigor and quality. Future studies should consider these guidelines as well. For brevity, they are provided in a bullet point format before each respective text section.

- *Has formal approval for the study been obtained to perform research with human subjects?*
- *Have all respondents been fully informed about potential risks and the purpose of the study?*
- *Have all respondents voluntarily provided their informed consent before their participation?*

The survey questionnaire and process have been reviewed and approved by the Institutional Review Board (Committee for the Protection of Human Subjects) of Catholic University of America before deployment, as required by U.S. law 45 CFR 46.101 2.(b)(2). The researcher has completed an online training course (certificate number 231272) on

Protecting Human Subject Research Participants, which is offered by the National Institutes of Health. All participants have been fully informed about risks (none were identified), voluntary responding, and research purpose in an informed consent form that needs to be signed electronically before the survey questionnaire itself can be accessed.

3.2 Anonymity

- *Have risks from potentially personally identifiable information been avoided or minimized?*
- *Have any potentially personal, confidential, or proprietary data been identified in advance?*
- *Have adequate protections been used to ensure confidentiality of the data in their medium?*

No personal data such as name, address, or company have been recorded to protect the participants. Each response is stored with its numerical Internet Protocol (IP) address, which is used to randomly draw the winner of the raffle prize. A name is only requested when electronically signing the informed consent. It is recorded separately from questionnaires and excluded from data analysis. Names are not used to identify the raffle prize winner. The researcher randomly draws one IP address from all completed surveys and forwards it to university staff. This staff then accesses the IP in the informed consent list, identifies the matching name, and forwards it to foundation staff. Finally, that staff looks up the full address from the National Electrical Contractors Association (NECA) membership list to mail the actual prize. This raffle process has been approved by the Institutional Review Board.

3.3 Demographics

- *Are qualitative and quantitative demographics (e.g., age, status, experience, location or region, and other data) provided to characterize the population and sample of respondents?*

The first section collects demographic information on the responding electrical contractors, including annual revenue, cash holdings, and interest-bearing investments in dollars, plus number of employees and number of individuals who are involved in financial decision making. Responders themselves are asked for their number of years of experience in financial decision making. A question on the educational level was considered initially but not included due to the expected range of backgrounds, to avoid

conveying the impression that the survey focuses on academic attainment rather than business practices, and due to the limited expected impact on the policies and procedures of the company. In discussions with the foundation staff, the wording “person most closely involved with financial decision making” has been developed to describe the intended target audience. This phrase is chosen because actual titles of corporate roles may vary significantly among companies. The survey is geographically limited to the US market. Its population includes all persons on the NECA member list, who are mostly senior managers. A survey of subscribers of *Electrical Contractor* magazine, whose number exceeds the 4,000 companies on the NECA list that was used, was infeasible due to their policy to restrict the total number of surveys per year. Yet, significant overlap exists between the two lists, so that this survey captures a relevant representative sample of the electrical contracting industry.

3.4 Methodology

- *Is the methodology of performing data collection, storage, and analysis explained in detail?*
- *Is the medium (e.g., mail, email, in-person, or telephone interview) appropriate for the study?*

The survey draft was approved by ELECTRI International before setting it up in the *SurveyMonkey* tool (Buchanan and Hvizdak 2009). Both paper and electronic versions were proofread. The online medium was chosen due to the low cost of reaching a large number of potential participants, their ease of use and thus low psychological barrier to responding, their assumed familiarity with online surveys, and the data-recording features within the password-protected database. Next, the link to the draft survey questionnaire was shared with pilot testers, whose feedback was incorporated into the final version. Finally, the link to the informed consent and final survey was forwarded to the foundation staff, who then emailed it to the population. Columns were added to the response data files to count the responses and calculate percentages, whereby 35 surveys were set as 100%. Next, minimum, maximum, mean, and standard deviations of the numerical values were calculated.

3.5 Sampling

- *Has it been ensured that the individuals targeted to respond have been actually sampled?*
- *Unless the population is measured, has randomization been used for generalizable results?*

- *Has any technique been used, e.g., systematic sampling, stratification, clustering, or quotas?*

To ensure that the most suitable senior individual in each targeted company would respond to the survey, instead of simply addressing the person whose email address was listed as a NECA member, the cover letter used the following specific wording: *Please ask the person most closely involved with financial decision making to respond to this survey questionnaire. If this is not you, kindly forward this email invitation to him/her.* The success of this step can be seen in Question 1.6 by the number of years of experience in financial decision making (not the years of a professional career) of the responders. No randomized sampling was needed, because the population was sampled. Stratification by size (Blasius and Brandt 2010) was not applied to avoid limiting the number of potential responses.

3.6 Response rate

- *Is the sample size sufficiently large considering the size and composition of the population?*
- *Has any response rate-improving technique been used? If so, has it been applied equally?*
- *Are the percentages or absolute number of responses sufficient compared to the population?*

A response rate-increasing technique (Neuman 2000) was used by offering a prize raffle of a \$100 computer store gift card to all respondents who completed the survey. Its flexibility and modern image were deemed inviting. The short time frame of the study precluded sending a reminder to increase the response rate. The prize raffle, cover letter, informed consent, and survey contents were all carefully prepared to attract respondents. Thus, it is expected that only few potential responses were missed. For purely statistical studies, e.g., a regression analysis that fits a model curve to experimental or observational data with an unknown error rate, published formulas (Lucko and Rojas 2010) provide recommended sample sizes depending on the number of explanatory input variables. In other words, if model coefficients shall be determined, the number of terms in the model would dictate how many data points suffice. The response rate, 35 of approximately 4,000, is acknowledged as small. Similar response rates that still gave valid results were reviewed by Said (2015). Several factors support the deduction that these data are generalizable. The purpose of this study is not to fit a statistical model but to yield a realistic snapshot of the US electrical contracting industry in terms of cash flow management.

Thus, it is important that the sample represent its population. Questions 1.1–1.6 confirm that the survey has successfully captured a cross section of company sizes by annual revenue and employees. Before the survey, both foundation staff and the tester cautioned that mostly large companies, who are strongly represented among the members, might respond. Yet, small companies may currently have less of an organizational structure for detailed cash flow management and are the ones that can benefit the most from this study. Therefore, it is extremely encouraging that (a) the survey responses are distributed across the full range from small to large companies and (b) large companies do not dominate the results. In fact, companies with less than \$1 million annual revenue have given 22.9% and less than \$5 million have given 45.7% of all responses. On the upper end, companies with more than \$10 million annual revenue have given 45.8% of the responses. Similarly, firms with less than 20 employees have given 40.0% of responses and firms with more than 50 employees have given 45.7% of the responses. Finally, the absolute number of responses is sufficiently large so that each size category by annual revenue and number of employees (except for the category 75–99 employees) is represented. Therefore, the survey is deemed valid, despite containing slightly less than the initially desired 50 responses. The length and depth of this survey itself, plus the competition with other occasional surveys in the same medium, may have contributed to this response rate. Yet, its overall quality and representative nature are unimpaired.

3.7 Questions

- *Are examples of questions or the entire instrument included, e.g., as an appendix?*
- *Are the types of questions adequate and measure past actions, not future intentions?*
- *Are their contents, language, sequence, breadth, and depth exhaustive and justified?*
- *Has the survey been pilot tested before use to ensure correct and consistent responses?*
- *For categorical questions, is the range of categories appropriate and do the questions avoid centrality bias?*

The alpha phase (internal question development) was cycled through five iterations, including feedback from foundation staff. A detailed literature review provided question topics as well as surveying methodology. For beta testing (pilot testing), three senior industry representatives were contacted. While only one provided feedback, its quality remedied their lacking responses.

Most questions are of multiple choice type. Each uses a Likert (1932) scale with an even number to elicit a tendential response and avoid centrality bias. They allow a “Not applicable/Don’t know” or “Other (please specify)” option as the case may be. Numerical ranges that are offered have been discussed with the foundation staff and tester and have even subdivisions. The verbal Likert categories represent a sequence from strong approval to strong disapproval as “Always, usually, sometimes, occasionally, rarely, never”. Each question uses ranking from one (most) to five (least). The questions ask about current practices and values, not intended behaviors or opinions. Care has been taken to phrase items consistently and without ambiguity. Several questions have been modified after alpha and beta testing, e.g., in the terminology, units, categories, and ranges.

3.8 Statistical analysis

- *Is the statistical analysis explained in detail and is it sound?*
- *Are comparisons drawn and patterns or trends identified?*

The statistical analysis of this study focuses on calculating measures of centrality and variability, i.e., the mean and standard deviation of numerical values. Minima and maxima are determined. Modes are determined for the histogram-type distributions across the predefined Likert scales. Because this study is not intended to fit a model, no further statistical processing is necessary.

3.9 Generalizability

- *Does the study reveal the geographic range and time frame of its data collection?*
- *Are the results generalizable and possibly applicable to other types of scenarios?*

Due to time constraints of this study, surveys have been collected for one month from July to August 2010. This duration has given responders ample time to complete it conveniently. Per the literature, longer periods do not necessarily give more responses (Porter and Whitcomb 2003). The NECA (2009) members represent an industry with a revenue volume of \$130 billion annually. The entire list has been targeted; all current members could contribute to the data set. Thus, this study can be generalized to them. While not all U.S. electrical firms are members,

they are likely few. Generalizability to all the U.S. electrical contractors is analogously conjectured for the major results.

The various listed best practices for survey studies have fulfilled research objective 1.

4 Results

Per IP addresses, 49 respondents started the survey, with 41 completing it. Four persons started, but abandoned the survey directly after their demographics or failed

to give any responses. Their access times indicate that breakoff (Peytchev 2009) occurred with a few minutes. One person made multiple attempts, two without any answers but completed the survey several days later. The total number of complete surveys was 35, which was the baseline of 100%. Considering the length of 57 individual subquestions and the depth of this survey questionnaire, compared to typical marketing surveys, this number was deemed satisfactory. The number of survey respondents saw a small decrease in later sections, as listed in Table 1.

From starts and finishes, the actual duration can be calculated. Ignoring the outlier who took multiple days and the incomplete attempts, the minimum duration was

Tab. 1: Number of responses to survey sections.

Section	Question	Type	Topic	Responses
0. Informed consent	N/A	Signature	N/A	49
1. Demographics	1.1	Multiple choice	Revenue	42
	1.2	Multiple choice	Assets	42
	1.3	Multiple choice	Investments	42
	1.4	Multiple choice	Employees	42
	1.5	Enter number	Decisions	42
	1.6	Multiple choice	Experience	42
	1.7	Open comment	N/A	03
2. Business practices	2.1	Multiple choice	Interest	35
	2.2	Multiple choice, enter other	Capital	40, 35
	2.3	Multiple choice (several)	Investments	32
	2.4	Multiple choice	Credit cards	28
	2.5	Multiple choice (long list)	Various	35
	2.6	Enter number	Invoices	35
	2.7	Enter number	Deposits	35
	2.8	Multiple choice	Clauses	35
	2.9	Multiple choice, enter other	Forecasts	31
	2.10	Open comment	N/A	04
3. Operating conditions	3.1	Multiple choice	Trends	35
	3.2	Multiple choice	Payments	35
	3.3	Multiple choice, enter number	Discounts	35
	3.4	Multiple choice, enter number	Retainage	35
	3.5	Multiple choice, enter number	Retainage	35
	3.6	Multiple choice, enter other	Retainage	35
	3.7	Enter number	Retainage	35
	3.8	Multiple choice	Receipts	35
	3.9	Multiple choice	Receipts	35
	3.10	Enter number	Change orders	35
	3.11	Enter number	RFI count	35
	3.12	Multiple choice	RFI response	35
	3.13	Multiple choice	RFI conversion	35
	3.14	Enter number	Credit line fee	35
	3.15	Enter number	Unused credit fee	35
	3.16	Enter number	Interest rate	35
	3.17	Open comment	N/A	02
4. Important factors	4.1	Ranking	Policies	34
	4.2	Multiple choice	Mail float	34
	4.3	Multiple choice	Check float	34
	4.4	Open comment	N/A	01

eight minutes (a review shows that this was completed) and the maximum was 169 minutes, with a mean of 28.35 minutes (close to the estimated duration of 30 minutes) and a standard deviation of 33.62 minutes.

4.1 Responses

The number of completed surveys has been deemed not large enough to allow a valid division into categories by company size and a comparison within the data set itself. Therefore, all responses are analyzed for the complete data set (after elimination of incomplete surveys). However, the observation that companies of different sizes were reached and that large companies (defined here as having annual revenue of more than \$30 million) did not dominate the results is deemed very positive. It is an indication that the survey questionnaire has reached a sufficiently representative cross section of the electrical contracting industry, whose responses are represented in the data set.

4.1.1 Demographics

Figures 1–6 visualize the results from this section. Internal validation on whether the survey has reached the intended recipients is possible. The skewed distribution with 60% of responders having more than 20 years of experience (Q1.1) is a strong confirmation that the target audience has been reached. While 42 responders have completed this section, only 35 completed the entire survey, which is used as the baseline of 100%. Company sizes are well distributed. While 34% have more than \$30 million in revenue, a comparable 29% have less than \$1 million. All categories contain responses for a representative coverage (Q1.1). A spread of assets is found (Q1.2), which concurs with the size range of companies. A somewhat bimodal distribution appears in that many companies have either few (26% have less than \$100,000) or many liquid assets (34% have more than \$1,500,000). Examination of the original data reveals a strong correlation between size and assets.

A similar picture emerges for investments (Q1.3). Yet more (31%) firms have invested less than \$20,000 in interest-bearing accounts, which also includes midsize companies. This may indicate that interest-bearing accounts are less available to small and midsize companies. Many (37%) large firms have invested more than \$500,000 in such accounts and securities. Comments to elucidate this section indicate that some companies may prefer conservative investment strategies (Q1.7).

Further supporting the representative results, well-distributed company sizes by number of employees are

found (Q1.4). Even firms with less than five employees have been reached (9%); 40% of all firms have less than 20 employees. On the other end of the spectrum are companies with more than 100 employees (37%). Of direct importance to the success of this study are the financial decision makers themselves. Not surprisingly, the number of such individuals is relatively small, ranging from one to six with a mean of 2.6 (Q1.5). In other words, less than three employees typically decide the financial fate of the company, which makes their experience all the more crucial. Fortunately, it is skewed toward multiple decades (Q1.6). Only two respondents have less than 10 years' experience, and the mode of the entire distribution is at 60% having more than 20 years of pertinent financial experience.

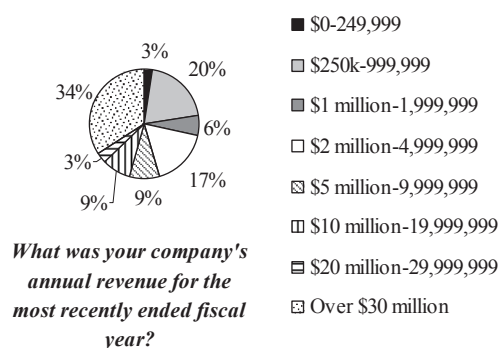


Fig. 1: Demographics—1.1 Company size by revenue.

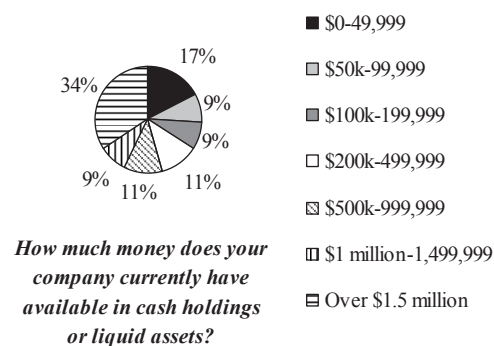


Fig. 2: Demographics—1.2 Company size by assets.

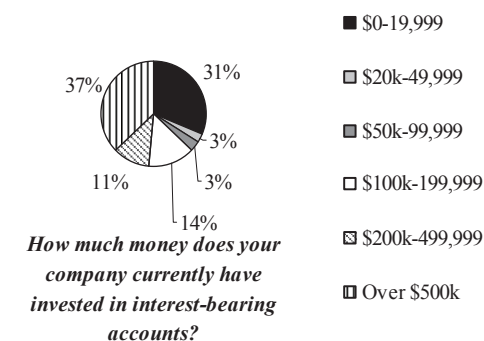


Fig. 3: Demographics—1.3 Company size by investments.

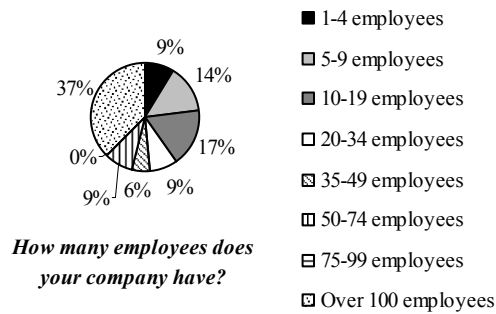


Fig. 4: Demographics—1.4 Company size by employees.

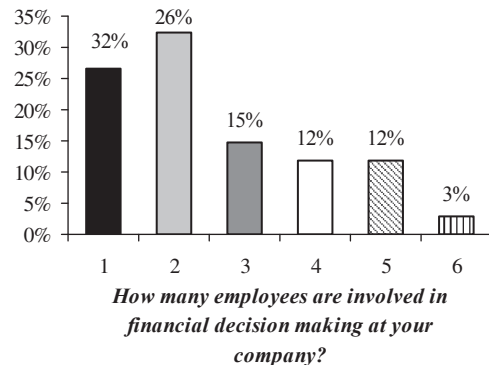


Fig. 5: Demographics—1.5 Company size by decision makers.

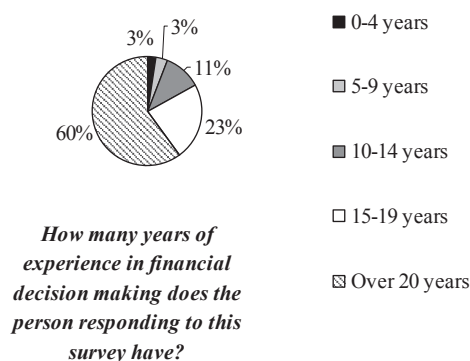


Fig. 6: Demographics—1.6 Decision maker's experience.

The sources of capital are dominated by retained earnings, i.e., reinvested profit (Q2.2). This is true for small and large companies, which can be characterized as focusing on healthy growth while seeking to remain somewhat independent of external debt. Still, 43% use commercial loans as their primary source and 37% use them at least as a secondary source of capital. Interestingly, shareholder loans are also used by 31.4% as the secondary source of capital. Investment patterns (Q2.3) indicate a strong preference for certificates of deposit (CDs), followed by mutual funds, i.e., portfolios of securities, stocks, and treasury bonds in declining order. Again, a conservative image emerges of companies that are somewhat risk averse. A majority (66%) of these firms do not use credit cards for short-term financing (Q2.4). Yet 14% do use them, including small-to-medium firms in the original data. If used, interest varies strongly from 0% (explained as always paying off debt) to 22%, with a mean of 8.5%. Thus, especially small firms should revisit their credit card terms.

The next question covers a broad array of business practices (Q2.5) as Figures 11–15 illustrate. Columns in Figure 11 use the following shadings: always (white), usually (light gray), sometimes (diagonal down),

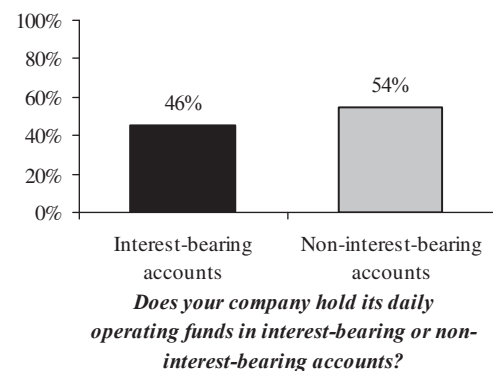


Fig. 7: Business practices—2.1 Interest.

4.1.2 Business practices

Figures 7–10 illustrate the results from this section. An almost even division emerges in how companies keep their daily operating funds (Q2.1). Just less than half of the respondents use interest-bearing accounts; just more than half use non-interest-bearing ones. This noteworthy split can give the latter ones a reason to enquire about opportunities to accrue extra earnings by using interest-bearing accounts if they qualify for them with banks. Examination of the original data reveals a strong correlation of the largest companies (more than \$30 million revenue) and interest-bearing accounts.

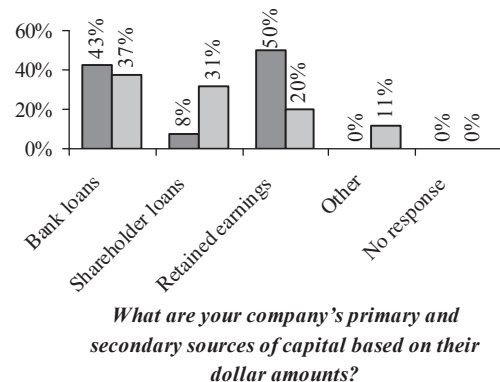


Fig. 8: Business practices—2.2 Capital.

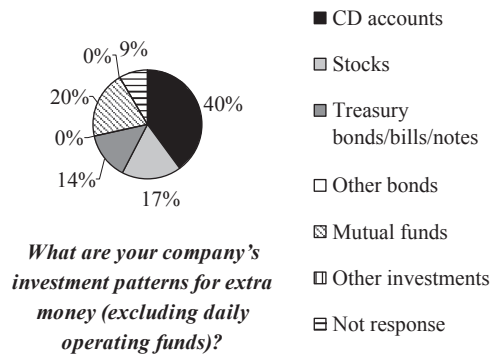


Fig. 9: Business practices—2.3 Investments.

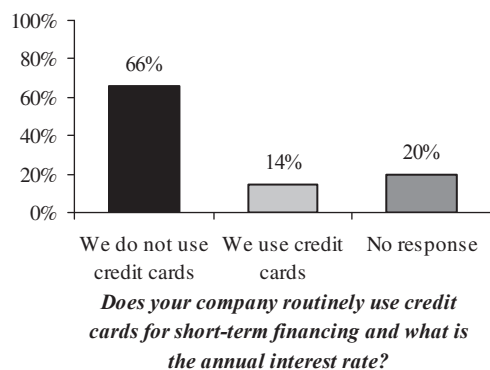


Fig. 10: Business practices—2.4 Credit cards.

occasionally (medium gray), rarely (vertical), never (dark gray), and not applicable/don't know (horizontal). Most firms (31%) use credit cards only sometimes. Most firms have never (46%) used outside consultants for financial planning, which correlates with their vast experience (Q1.6). Most of them (34%) do not have a formal procedure to update budgets, but some firms always or usually do so. Reminder letters of accounts receivable are used occasionally (26%), but the proportion of firms using them ranges from 17% firms who always use them to 17% who never use them. Managers participate in cash flow planning, which is always the case for 54% of responses. Most firms rarely (23%) – or never (23%) – request references from new clients. This may show the desire for repeated business, as the tester notes. They are usually (26%) checked, but this is not guaranteed (17% always, but 20% never).

Taking advantage of prompt payment, discounts (31% always, 29% usually) are widely used for purchases. They are also offered often (43% usually, 29% sometimes). Credit extensions with suppliers are sometimes (34%) negotiated, but mostly not sought (57% sometimes to never). Firms watch the payment performance of their clients with whom they usually (31%) seek repeat business and – conversely – usually (43%) avoid those with a poor payment record. Yet most firms rarely (37%) or never

(34%) offer their own discounts to accelerate accounts receivable. Because discounts can be designed with a positive cost-to-benefit ratio (i.e., a small reduction is still better than not having the payment available and having to borrow it for future investments), this response is surprising. Firms usually (26%) track required versus discretionary expenses; these records are an opportunity to fine-tune discretionary expenses to improve cash flows. Penalties are rarely or never (60%) used to deter late payments. This may be for fear of alienating clients or general contractors. Firms usually (54%) invoice directly after the work is complete, but only 17% always do so. The significant variability in these business practices suggests that they are unique to the culture of each firm. Because such practices can have a directly positive or negative impact on cash flows, companies should review and potentially adjust their business practices.

The next question examines these subquestions (Q2.5) in more detail (and provides another internal consistency test). Invoices are sent within a wide range of 1–40 business days, with a mean of 8.7 days (Q2.6). Similar to the response to Q3.5, only 26% of firms report immediate invoicing, i.e., less than five days after the work. Another 40% firms invoice within one work week; the remaining firms take two weeks to more than a month. This clearly constitutes an opportunity for improvement. Yet, received payments are deposited rapidly within one business day by 64% of firms (Q2.7).

Figure 14 uses the same shading as Figure 11. Companies are usually (43%) subject to “pay when paid” clauses, i.e., get paid after their general contractor has been paid by its owner (Q2.8). A “pay if paid” clause is less common (Q2.9). The next question explores how frequently cash flow forecasts are updated. Most companies do so monthly (34%), but a significant number does so either weekly (26%) or only quarterly (26%). Comments interestingly indicate that cash flow forecasting may not be rigorously implemented in some firms, which is another opportunity for improvement. Open-ended comments (Q2.10) focused on trying to pay off credit cards quickly.

4.1.3 Operating conditions

Figures 16–31 visualize the results from this section. It begins by asking about observable trends in the duration of the payment cycle (Q3.1). Most companies indicated slight or moderate increases (26% and 29%), but 17% noted a strong increase. This average payment cycle is 30 and 60 days for 63% (Q3.2) and reaches up to 90 days for another 23%, and even longer for others—one firm even

reported waiting on average for a year. This alarming insight is supported by the literature (Setzer 2009). Such durations are detrimental to the cash flow. Most suppliers (86%) offer discounts (Q3.3), which typically (35%) are 2/10 net 30 (i.e., subtract 2% of the bill if paid within 10 days, full amount due within 30 days). A variety of other terms have also been listed.

Several questions focus on retainage, as Figures 19–22 show. They distinguish two periods—measured after the end of the work by the firm; and after the end of the entire project (Q3.4 and Q3.5). The former is expected to be slightly higher. Most companies (34% and 29%) have

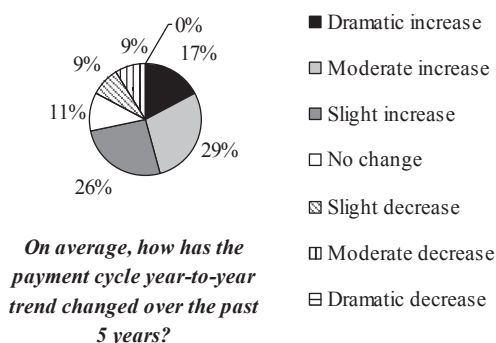


Fig. 16: Operating conditions—3.1 Trends.

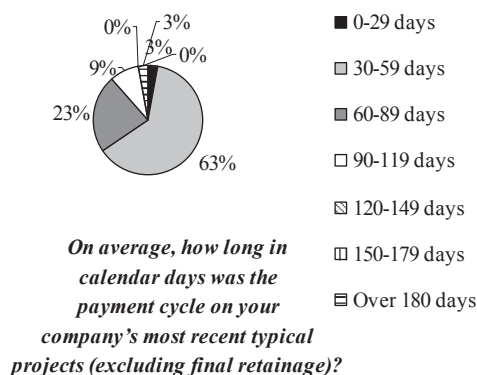


Fig. 17: Operating conditions—3.2 Payments.

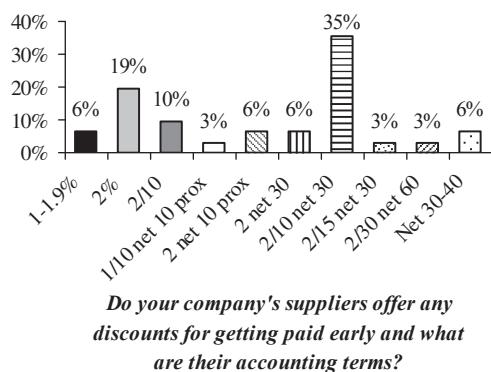


Fig. 18: Operating conditions—3.3 Discounts.

given 60 to less than 90 days. Fewer firms (20% and 26%) have shorter periods. But durations of 90 or more days are incurred by 45% and 43%, respectively. Moreover, 11% and 9% of respondents even incur waits of more than half a year to be paid fully. Values are similar for both questions, perhaps because electrical contractors commonly work in the last phase of a project, after it is weather enclosed. Several comments have noted an average wait of either half a year or a year. Clearly, receiving the final payment, including the released retainage, is a major issue for these subcontractors.

A majority (86%) reports that the initial retainage that is withheld is 10% off each bill (Q3.6). Only 9% of firms have a more favorable 5% in their contract. Comments from two respondents indicate an unusual 8% and 15%. For 53%, it drops from 10% to 5% later in the project (Q3.7, one respondent has listed 4% of labor cost, others even less), but 35% do not receive such relief.

While most (43%) firms (Figure 23, Q3.8) respond that they consider waiting to be paid at least manageable, a significant 29% consider it a medium-term problem over a range of weeks to months and 11% consider it a long-term problem in a range of months to years. This observation

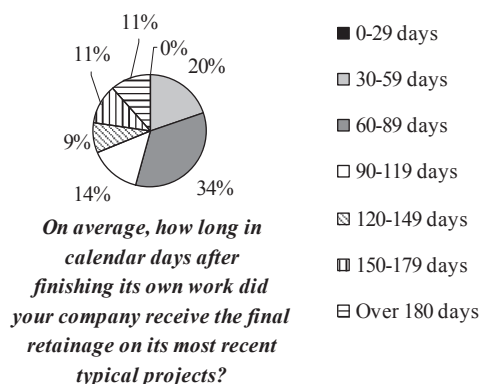


Fig. 19: Operating conditions—3.4 Retainage after work finish.

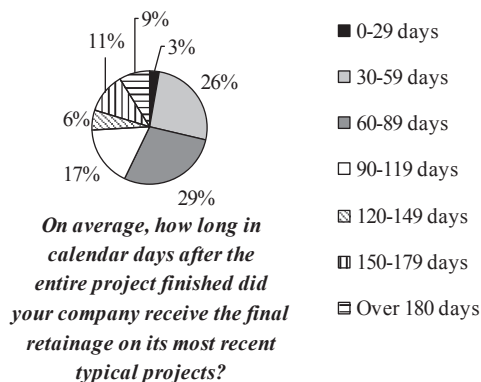


Fig. 20: Operating conditions—3.5 Retainage after project finish.

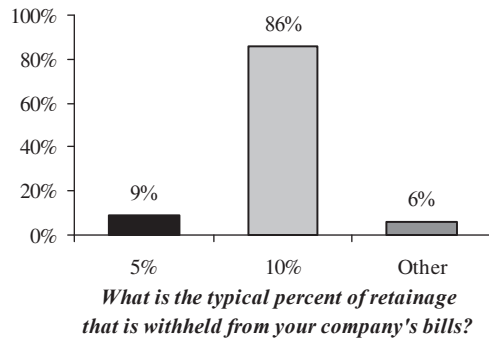


Fig. 21: Operating conditions—3.6 Retainage after project finish.

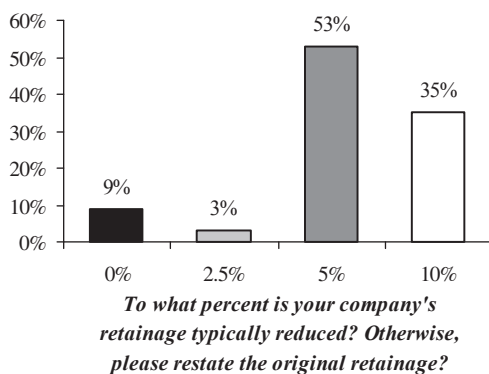


Fig. 22: Operating conditions—3.7 Retainage reduction.

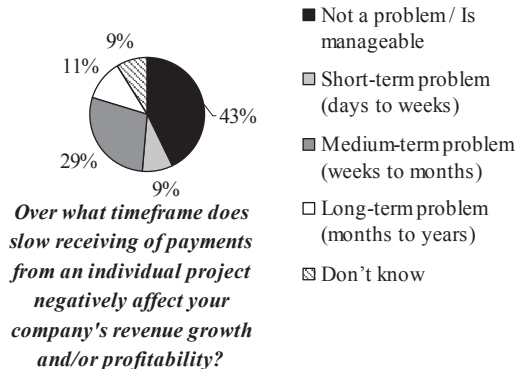


Fig. 23: Operating conditions—3.8 Receipt time frame.

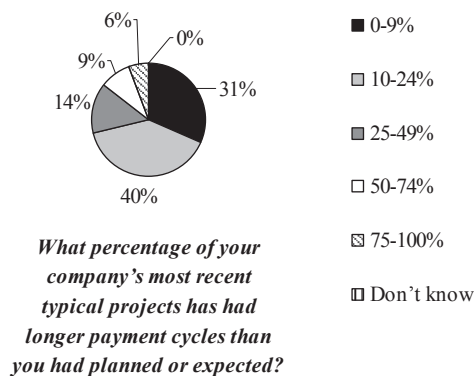


Fig. 24: Operating conditions—3.9 Receipt delays.

is supported when asked about the percentage of recent projects that had longer-than-expected payment cycles (Figure 24, Q3.9). Most (40%) respondents state that 10% to fewer than 25% of their projects have slower payments. Values for higher categories are a cause for concern, where 29% of firms have incurred delayed payments. These questions implicitly assume similar contract conditions and administrative procedures by each company for issuing bills, which is reasonable.

Other items that may affect project finances are change orders and requests for information (RFIs). Results are shown in Figures 25–28. Firms have been asked for minimum, average, and maximum number of change orders for their projects, so that different projects by the same firm can be surveyed. Projects have experienced from 0 to 20 change orders on the low end, from 2 to 35 on average, and from 2 to 310 on the high end (Q3.10). Extremely large values of 2,500, 6,000, and 87,000 are omitted as outliers that may have been from megaprojects or may have been misunderstood as total number of change orders, not just for the electrical work. One correction has been made in a response that has swapped minimum and maximum. The RFIs show a similar set of ranges from 0 to 40, 0 to 60, and 0 to 1,000 for minimum,

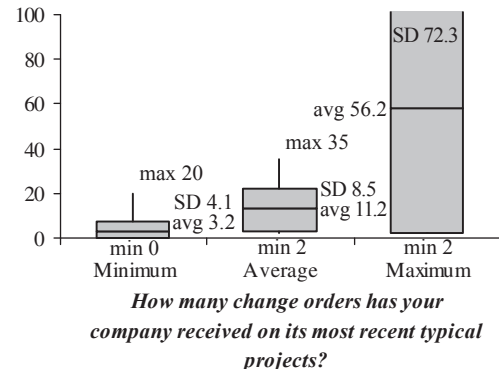


Fig. 25: Operating conditions—3.10 Change orders.

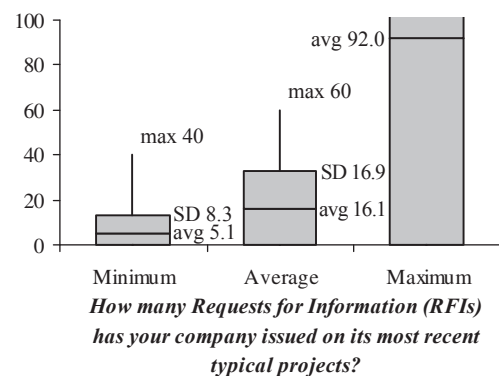


Fig. 26: Operating conditions—3.11 Requests for information.

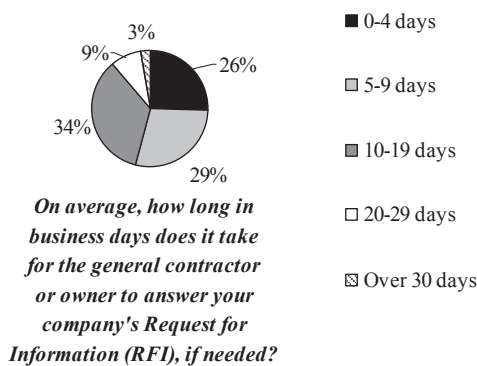


Fig. 27: Operating conditions—3.12 Response duration.

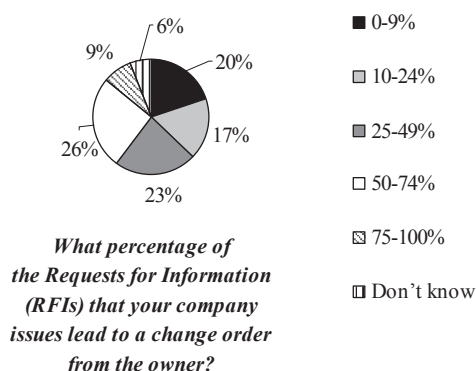


Fig. 28: Operating conditions—3.13 Request conversion.

average, and maximum numbers of RFIs on typical projects (Q3.11). In effect, responses to these two questions give a three-point distribution estimate across projects within each company. To extract a tendency, the arithmetic mean and standard deviation are calculated. On average, typical projects have incurred from 3.2 (mean of minima) to 56.1 (mean of maxima) – and on average, 11.2 (mean of means) – change orders. The RFIs range from 5.1 (mean of minima) to 92.0 (mean of maxima), with an average of 16.1 RFIs (mean of means). The RFIs exceed the number of change orders, which is expected as normal. Note that the standard deviation grows strongly for the maxima. In other words, much variability appears for the maxima of change orders and RFIs. Examination of the original data shows a strong correlation of company size and maximum number of change orders; 5 of 7 respondents who noted maximum change orders – more than 100 – are companies with more than \$30 million revenue. This observation is explained by the fact that larger firms work on significantly larger and complex projects.

If an RFI is submitted, it takes 10 to less than 20 days for most respondents (34%) to receive their response and 55% get it even faster (Q3.12). Note that the permissible period for responding is specified in the contract. This question is included because changes may cause rework, in turn

affecting costs and thus payments. Change orders may be triggered by RFIs from the contractor or simply by a sudden wish of the owner. The percentage values given in the survey cover the entire spectrum of possible ranges (Q3.13), which indicates that project complexity may drive them.

The next question addresses credit lines, as shown in Figures 29–30. Most (60%) firms do not have to pay any fee for the credit line itself, besides the normal interest. But the other responses are diverse; one firm responded as not having a credit line, and several responses ranged from 0.5 to 7.0 per year (Q3.14). Possibly these respondents mistook any fixed fee (which the question has meant) for interest. Yet the largest companies listed explicit dollar values for maintaining a line of credit. Almost no firm is charged an unused credit fee (Q3.15), also called commitment fee, which has been described by Elazouni and Metwally (2005), yet one respondent listed a percentage for it.

Interest rates for borrowing capital vary strongly (Figure 31, Q3.16) and reach from below the prime rate as a benchmark to 14%, which is a large range, even considering differences in the creditworthiness. The maximum of 14% is a possible outlier; it is reported by a small company with less than five employees. Two respondents commented that they rarely use any bank loans.

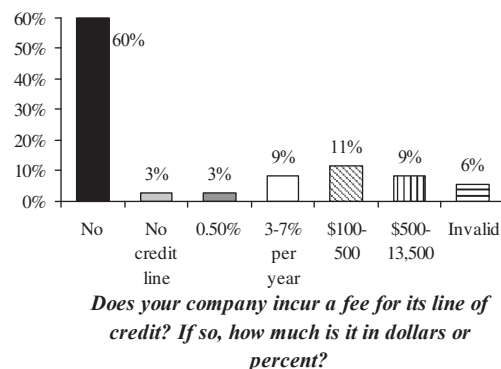


Fig. 29: Operating conditions—3.14 Credit line fee.

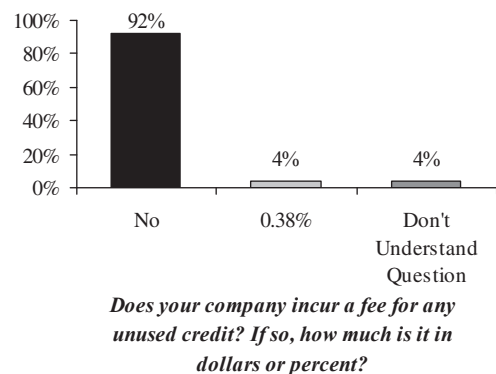


Fig. 30: Operating conditions—3.15 Unused credit fee.

4.1.4 Important factors

Figure 32 shows the results for five subquestions where the respondents have ranked the relative importance of financial policies to gain insight into their priorities (Q4.1). Rankings are shaded from highest to lowest as white, light gray, diagonal down, medium gray, and vertical. It places “minimizing costs and expenditures” first (51%), “increasing the speed of accounts receivable collection” second (37%), “minimizing bank balances or debt” third (37%), “decreasing the speed of accounts payable payment” fourth (43%), and “other policy” fifth (57%). Companies appear to be cost conscious and are aware of the importance of collecting outstanding balances.

The final two questions in Figures 33 and 34 ask about two possible ways in which firms may fine-tune their cash flow if they use paper checks for transactions. Mail-time float, the period by which payments are in the mail and not yet cashed, are mostly never (34%) or rarely (26%) exploited, but some firms do so sometimes (17%) (Q4.2). Check-clearing float, the subsequent period for a bank to process a submitted transaction, is even more uncommon and is either never (46%) or rarely (23%) used. It is possible that firms consider such earnings from a few days of

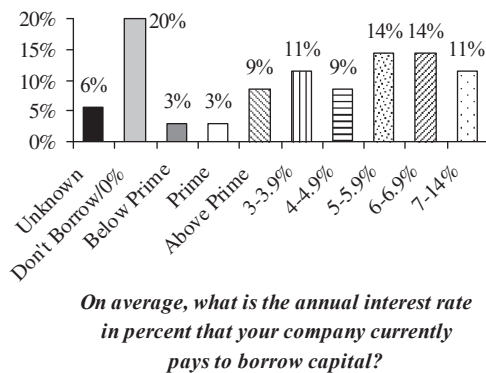


Fig. 31: Operating conditions—3.16 Interest rate.

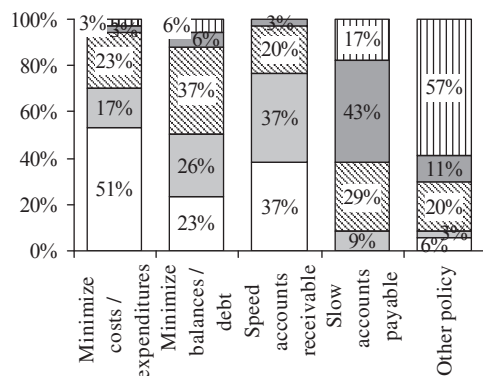


Fig. 32: Important factors—4.1 Ranking policies.

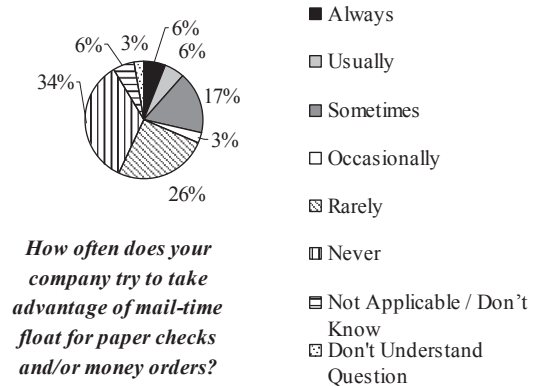


Fig. 33: Important factors—4.2 Mail float.

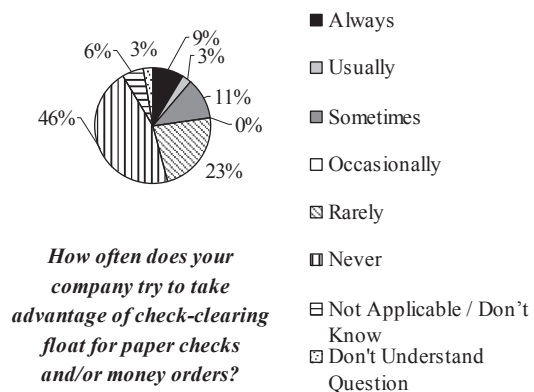


Fig. 34: Important factors—4.3 Check float.

extra interest too small to justify the administrative effort of timing transactions consciously.

4.2 Limitations

- Are limitations of the study in terms of its concepts, scope, and sampling acknowledged?
- Are variables of interest measured in a triangulated manner by more than one question?
- Can invalid or incomplete responses be remedied via open-ended or follow-up questions?

Limitations are acknowledged as follows. Financial planning and management is investigated by contacting one decision maker in each firm to ask about its processes and procedures. Due to the vast number of projects by these firms, some questions ask for typical values rather than specific data of multiple projects. In Q2.6 and Q2.7, a few respondents have given the values “7” or “14” as responses, despite asking for business days. This has been adjusted. A few incomplete or invalid responses could not be reconstructed and are omitted as outliers from statistical analysis.

A few identical responses to Q3.4 and Q3.5 may indicate that respondents did not distinguish these questions. Yet the pilot tester indicates that firms often must wait until after the project finish for their final payment and electrical contractors work on later stages of projects. Raw data show that within respondents, their values for Q3.4 consistently exceed those of Q3.5. Similarly, Q3.14 versus Q3.16 may have been unclear—the former aims at an opening or maintenance fee, while the other involves interest for borrowing funds. Yet responses have different units within respondents, so that the question has mostly been understood; only one has provided two identical responses.

Results formally apply to NECA members, but it is expected that they can be useful for most companies in the US electrical contracting industry, as respondents covered a wide range of company sizes. The sample size has been discussed previously; it has been determined that valid insights can be gained due to the careful methodology used for questionnaire design and application.

5 Spreadsheet tool

A spreadsheet implementation has been proposed to provide contractors who have not yet planned, controlled, or managed their cash flow in detail for each transaction with a quick and simple tool. Its features were designed to provide clarity by creating a graphical representation over time:

- **User-friendliness:** Each function is annotated and all formulas can be reviewed and tracked by the user. Calculations for daily values are placed onto a separate sheet for clarity. Drop-down menus allow easy classification by type and enable updating of the status of each transaction;
- **Transactions:** Each transaction is tracked separately by type, amount, and due date. Values that are calculated automatically for convenience, e.g., cost plus profit margin or due date, can be overwritten by the user if needed, e.g., to reflect an unevenly spread profit across costs;
- **Visualization:** The tool contains a dynamic chart that plots the cash outflows, inflows, their difference, the balance including financing fees (i.e., interest), and the credit limit. Different colors clearly show their behavior over time. Exceeding the credit limit creates a warning;
- **Limitations:** The tool is set up to accommodate 1,000 transactions and 1,000 calendar days, but it can be easily extended by increasing the cell addresses to fill the entire spreadsheet.

Additional tools that also address time scheduling and cost estimating have been described in the literature (e.g., Hegazy and Ersahin 2001a, 2001b). Different practices can be tested for their impact on the financial performance. It is hoped that this tool will aid especially smaller contractors to improve competitiveness with decreased, decelerated cash outflow and increased and accelerated inflow. This implementation is available to all member companies on contacting ELECTRI.

The preceding detailed analysis and implementation tool has fulfilled research objective 2.

6 Recommendations

6.1 Recommended best practices

The following best practices have been compiled by expanding the results from survey responses with scholarly publications on financial management, in particular cash flow, which have been compiled through this research, including but not limited to Cui et al. (2010), Görög (2009), Hill (2009), Setzer (2009), Brown (2008), Shapiro (2008), Dash Group (2006), Walters and McArtor (2003), Hwee and Tiong (2001), Gitman et al. (1979), and Roper and McLin (2010). For this research step, the specific methodology has involved tabulating the results—especially explicit recommendations—from all of the scholarly publications that have been collected during this study. Then categories have been developed, sorted by when items apply in the chronology of cash flows, redundancies have been eliminated, and the final list has been condensed into specific action items. They do not apply equally to all electrical contracting companies; especially small companies may benefit from considering using them to improve their existing policies and practices within their own market.

6.1.1 Cash outflows

- **General:** Seek minimizing costs in all categories. Reduce surplus inventory. Perform cost–benefit analyses of any new investments. Time cash outflows to pay as late as possible;
- **Operations:** Analyze relationship between work performance and costs using Earned Value indicators, i.e., budgeted/actual cost of work scheduled/performed and their variances;
- **Banks:** Seek a review and update of credit fees for own company. Obtain and review offers from competing

banks to access best financing. Compare with investing retained earnings;

- Suppliers: Perform cost–benefit analysis and take advantage of discount offers if beneficial. Separately track cost categories, e.g., materials, tools and equipment, labor, and overhead.

6.1.2 Cash inflows

- General: Immediately mail bills for any completed work. Consider offering early payment discounts or requiring late payment fees. Request and check financial references of clients;
- Sources: Be aware of different possible sources of capital and that each, including retained earnings, has costs. Select an appropriate mixture for operating funds versus long-term investments;
- Contracts: Negotiate fair payment terms, including reduction of retainage. Seek deposits or advances if at all possible. Specify clear durations for processing and payment of submittals;
- Reminders: Use clear and strong reminder letters at regular intervals to collect accounts payable. Note and execute, if needed, a lien right on the completed work to ensure payment;
- Receipts: Consider offering discounts to accelerate payment receipts if possible. However, this item certainly also depends strongly on the contract conditions of “pay when/if paid.”

6.1.3 Administrative items

- Proactiveness: Actively plan, control, and manage cash flow in every business aspect. Use modern software to track each transaction. Maintain close communication with all clients;
- Interest: Immediately deposit cash or check payments. Seek using interest-bearing accounts for assets (even short term) if possible. Consider using but always paying off credit cards;
- Analysis: Regularly perform analyses of budget and financial position using indicators and ratios of (liquid) assets to current liabilities, work-in-progress, inventory, and change orders;
- Forecasting: Track and forecast cash outflows and inflows in detail regularly and frequently. Weekly updates may be useful, even if payment receipts occur only on a monthly time frame;
- Visualization: Plot and track cash flow graphically to identify patterns and trends and support decision

making. Can be part of a sensitivity analysis to evaluate impact of different options;

- Policies: Review policies as to whether they are comprehensive, beneficially positioned with regard to both cash outflows and inflows, and are consistently implemented in daily practice.

Achieving these items may entail actively negotiating credit terms with suppliers, using discounts to accelerate their own cash receipts, and moving toward more immediate invoicing to remedy potential inefficiencies in the financial approach. This section has fulfilled research objective 3.

6.2 Recommended future research

While the preceding group of questions has spanned the breadth and depth of financial planning and management, several aspects merit further study. An item that has been excluded from the study for brevity, but may matter in practice, is the brand, cost, and functionality of the particular business software that firms use for their financial administration. It would also be a challenge to see if individual firms could be found who wish to improve their approach based on these current results, implement the best practices, and serve as a major case study. Such research would need a similarly careful design as this study. Of course, of interest would also be a comparative study across sectors of the construction industry to reveal if and how specialty contractors are exposed to different challenges based on the nature of their work, their relationship with general contractors or owners, and the overall maturity of their sector with respect to financial matters.

7 Contributions to the body of knowledge

This study has significantly deepened the understanding of how electrical contractors plan and manage their financial affairs. One contribution has been designing and executing the study with a survey questionnaire in a carefully designed manner, so that it can literally serve as a template for future quantitative or qualitative research in this area. Moreover, another contribution is that various similarities and differences across the size ranges of electrical contractors have been identified. Furthermore, a series of detailed and tangible best practices has been provided,

which—while having been developed for the population that has been studied—certainly are applicable to firms outside of the electrical sector. While results have been derived from U.S. data, it is anticipated that little or no modification will be needed to transfer and apply the recommended set of best practices to other countries. It is hoped that these outcomes may benefit them as well.

Acknowledgments

Support of ELECTRI International (Early Career Award grant 9232009) for parts of this study is gratefully acknowledged. The author expresses thanks to Wayne M. Butler of the Washington metropolitan region chapter of the National Electrical Contractors Association for testing; Russell J. Alessi, President; Laura A. Capuco, Director of Operations; Astra Hudson, Circulation Manager of ELECTRI; Elaine M. Fang, graduate research assistant; Mary Kate Zabroske, assistant to the Dean for Administration; and the School of Engineering at Catholic University of America for facilitating it.

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